

## PERSONAL

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ANIKET BERA

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ADDRESS: Brendan Iribe Center for Computer Science and Innovation, 5144,  
College Park, MD 20740

PHONE: +1 919-578-6233

EMAIL: [ab@cs.umd.edu](mailto:ab@cs.umd.edu)

WEB: <http://cs.umd.edu/~ab/>, [Google Scholar](#)

**Areas of Interest:** *Multi-agent simulation, Virtual Reality, Robotics, Computer Graphics, Crowd Tracking, Prediction, Human behavior modeling, Cognitive modeling: Knowledge, reasoning and planning for intelligent characters.*

## EDUCATION

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- 2012 - 2017 PhD in COMPUTER SCIENCE,  
**University of North Carolina**, Chapel Hill  
**Advisor:** Prof. Dinesh Manocha
- 2012 - 2016 MS in COMPUTER SCIENCE,  
**University of North Carolina**, Chapel Hill  
**Advisor:** Prof. Dinesh Manocha
- FEBRUARY 2012 MBA in INFORMATION AND COMMUNICATIONS TECHNOLOGY,  
**Jaypee Business School**, India
- MARCH 2011 B.Tech in COMPUTER SCIENCE,  
**Jaypee Institute of Information Technology University**, India

## PROFESSIONAL EXPERIENCE

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- 2019 - PRESENT ASSISTANT RESEARCH PROFESSOR at **UMIACS, UMD College Park**  
*Research on Robotics, AI and Physically-based Modelling*
- 2018 - 2019 RESEARCH FACULTY at **Dept of Computer Science, UNC Chapel Hill**  
*Research on automated crowd behavior learning and autonomous robot navigation*
- 2017 - 2018 POSTDOCTORAL RESEARCH ASSOCIATE at **GAMMA Group, UNC Chapel Hill**  
*Research on data-driven large-scale pedestrian behavior and personality prediction*
- 2012 - 2017 GRADUATE RESEARCH ASSISTANT at **GAMMA Group, UNC Chapel Hill**  
**Advisors:** Prof. Dinesh Manocha, Prof. Ming Lin  
*Research on data-driven crowd simulation, visual tracking, mixed reality simulations.*
- SUMMER 2014 **LAB ASSOCIATE** at **Disney Research Los Angeles**  
**Advisor:** Prof. Carol O'Sullivan  
*Research on crowd simulation, pedestrian tracking.*
- SUMMER 2013 RESEARCH INTERN at **Intel Corporation**  
**Group:** Advanced Visual Computing Group  
*Designed new crowd tracking algorithm and optimized on Intel chipsets and mobile devices.*
- JUNE 2010-2011 RESEARCH INTERN at **Centre for Development of Advanced Computing**  
*Work on Development of Robust Document Analysis and Script Recognition*

## BIBLIOGRAPHY

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### Book Chapter:

- Realtime Pedestrian Tracking and Prediction in Dense Crowds - **Aniket Bera**, *David Wolinski, Jullian Pettre, Dinesh Manocha* [Book Chapter on Group and Crowd Behavior for Computer Vision, 2017]

### Refereed Publications:

- EVA: Modeling Perceived Emotions of Virtual Agents using Expressive Features of Gait and Gaze- *Tanmay Randhavane, Aniket Bera, Kyra Kapsaskis, Kurt Gray, Dinesh Manocha* [ACM Symposium on Applied Perception 2019, Barcelona, Spain]
- DensePeds: Pedestrian Tracking in Dense Crowds Using FRVO and Sparse Features- *Rohan Chandra, Uttaran Bhattacharya, Aniket Bera, Dinesh Manocha* [IEEE/RSJ International Conference on Intelligent Robots and Systems 2019, Macau, China]
- TraPHic: Trajectory Prediction in Dense and Heterogeneous Traffic Using Weighted Interactions- *Rohan Chandra, Uttaran Bhattacharya, Aniket Bera, Dinesh Manocha* [IEEE Conference on Computer Vision and Pattern Recognition 2019, Long Beach, USA]
- FVA: Modeling Perceived Friendliness of Virtual Agents Using Movement Characteristics- *Tanmay Randhavane, Aniket Bera, Kyra Kapsaskis, Kurt Gray, Dinesh Manocha* [IEEE Transactions on Visualization and Computer Graphics 2019 (Special Issue)], [IEEE International Symposium on Mixed and Augmented Reality 2019, Beijing, China]
- Modeling Data-Driven Dominance Traits for Virtual Characters using Gait Analysis- *Tanmay Randhavane, Aniket Bera, Emily Kubin, Kurt Gray, Dinesh Manocha* [IEEE Transactions on Visualization and Computer Graphics 2019]
- Pedestrian Dominance Modeling for Socially-Aware Robot Navigation- *Tanmay Randhavane, Aniket Bera, Emily Kubin, Austin Wang, Kurt Gray, Dinesh Manocha* [IEEE/RSJ International Conference on Robotics and Automation 2019, Montreal, Canada]
- PORCA: Modeling and planning for autonomous driving among many pedestrians - *Yuanfu Luo, Panpan Cai, Aniket Bera, David Hsu, Wee Sun Lee, Dinesh Manocha* [IEEE Robotics & Automation Letters 2018]
- Data-Driven Modeling of Group Entitativity in Virtual Environments - **Aniket Bera**, *Tanmay Randhavane, Emily Kubin, Husam Shaik, Kurt Gray, Dinesh Manocha* [VRST 2018: ACM Symposium on Virtual Reality Software and Technology, Tokyo, Japan]
- The Socially Invisible Robot: Navigation in the Social World using Robot Entitativity - **Aniket Bera**, *Tanmay Randhavane, Emily Kubin, Austin Wang, Kurt Gray, Dinesh Manocha* [IEEE/RSJ International Conference on Intelligent Robots 2018, Madrid, Spain]
- LCrowdV: Generating labeled videos for pedestrian detectors training and crowd behavior learning - *Ernest Cheung, Tsan Kwong Wong, Aniket Bera, Dinesh Manocha* [Neurocomputing 2019]

- MixedPeds: Pedestrian Detection in Unannotated Videos using Synthetically Generated Human-agents for Training - *Ernest Cheung, Anson Wong, **Aniket Bera**, Dinesh Manocha* [AAAI 2018, Louisiana, USA]
- Identifying Driver Behaviors using Trajectory Features for Vehicle Navigation - *Ernest Cheung, **Aniket Bera**, Emily Kubin, Kurt Gray, Dinesh Manocha* [IEEE/RSJ International Conference on Intelligent Robots 2018, Madrid, Spain]
- F2FCrowds: Planning agent movements to enable face-to-face interactions - - *Tanmay Randhavane, **Aniket Bera**, Dinesh Manocha* [Presence: Teleoperators & Virtual Environments, 2018]
- Aggressive, Tense, or Shy? Identifying Personality Traits from Crowd Videos - ***Aniket Bera**, Tanmay Randhavane, Dinesh Manocha* [International Joint Conference on Artificial Intelligence 2017, Melbourne, Australia]
- SocioSense: Robot Navigation Amongst Pedestrians with Social and Psychological Constraints - ***Aniket Bera**, Tanmay Randhavane, Dinesh Manocha* [IEEE/RSJ International Conference on Intelligent Robots and Systems 2017, Vancouver, Canada]
- Interactive Crowd-Behavior Learning for Surveillance and Training - ***Aniket Bera**, Sujeong Kim, Dinesh Manocha* [IEEE Computer Graphics and Applications, Special Edition 2016]
- Online parameter learning for data-driven crowd simulation and content generation - ***Aniket Bera**, Sujeong Kim, Dinesh Manocha* [Computers & Graphics Journal 2016]
- Realtime anomaly detection using trajectory-level crowd behavior learning - ***Aniket Bera**, Sujeong Kim, Dinesh Manocha* [IEEE Conference on Computer Vision and Pattern Recognition 2016, Las Vegas, USA]
- GLMP-Realtime Pedestrian Path Prediction using Global and Local Movement Patterns - ***Aniket Bera**, Sujeong Kim, Dinesh Manocha* [IEEE International Conference on Robotics and Automation 2016, Stockholm, Sweden]
- Interactive and adaptive data-driven crowd simulation - *Sujeong Kim, **Aniket Bera**, Dinesh Manocha* [IEEE Virtual Reality 2016, South Carolina, USA]
- Interactive crowd content generation and analysis using trajectory-level behavior learning - *Sujeong Kim, **Aniket Bera**, Dinesh Manocha* [IEEE International Symposium on Multimedia 2015, Florida, USA]
- Efficient Trajectory Extraction and Parameter Learning for Data-Driven Crowd Simulation - ***Aniket Bera**, Sujeong Kim, Dinesh Manocha* [Graphics Interface 2015, Halifax, Canada]
- REACH - Realtime Crowd tracking using a Hybrid motion model - ***Aniket Bera**, Dinesh Manocha* [IEEE International Conference on Robotics and Automation 2015, Seattle, USA]

- Realtime Multilevel Crowd Tracking using Reciprocal Velocity Obstacles - **Aniket Bera**, *Dinesh Manocha* [IEEE International Conference on Pattern Recognition 2014, Stockholm, Sweden]
- AdaPT: Real-time Adaptive Pedestrian Tracking for crowded scenes - **Aniket Bera**, *Nico Galoppo, Dillon Sharlet, Adam Lake, Dinesh Manocha* [IEEE International Conference on Robotics and Automation 2014, Hong Kong]
- Line Based Robust Script Identification for Indian Languages - *Bhupendra Kumar, Aniket Bera, Tushar Patnaik* [International Journal of Information and Electronics Engineering 2012]
- Fast vectorization and upscaling images with natural objects using canny edge detection - **Aniket Bera** [IEEE International Conference on Electronics Computer Technology 2011, India]
- Scene flow estimation from stereo video source - **Aniket Bera** [International Conference on Advances in Computing and Artificial Intelligence 2011, India]

#### Doctorate Thesis:

- Interactive Tracking, Prediction, and Behavior Learning of Pedestrians in Dense Crowds - **Aniket Bera**, *Advisor: Dinesh Manocha* [2017]

#### Workshop Publications/Talks:

- Socially-aware Human Learning - **Aniket Bera**, *Tanmay Randhavane, Dinesh Manocha* [Multi-modal Learning from Videos, IEEE Conference on Computer Vision and Pattern Recognition Workshops 2019]
- Improving Social Human-Robot Teaming in Crowded Environments - **Aniket Bera**, *Tanmay Randhavane, Kurt Gray, Kyra Kapsaskis, Austin Wang, Dinesh Manocha* [Human-Robot Teaming Beyond Human Operational Speeds (*IEEE International Conference on Robotics and Automation 2019 Workshop*), Montreal, Canada]
- The Emotionally Intelligent Robot: Socially-aware Human Prediction **Aniket Bera**, *Tanmay Randhavane, Kurt Gray, Kyra Kapsaskis, Austin Wang, Dinesh Manocha* [Long-term Human Motion Prediction Workshop 2019 & Human Movement Science for Physical Human-Robot Collaboration (*IEEE International Conference on Robotics and Automation 2019 Workshop*), Montreal, Canada]
- Interactive Surveillance Technologies for Dense Crowds - **Aniket Bera**, *Dinesh Manocha* [Association for the Advancement of Artificial Intelligence 2018 Fall Symposium Series 2018 (*Artificial Intelligence in Government and Public Sector*), Arlington, USA]
- Behavior Modeling for Autonomous Driving - **Aniket Bera**, *Dinesh Manocha* [Association for the Advancement of Artificial Intelligence 2018 Fall Symposium Series 2018 (*Reasoning and Learning in Real-World Systems for Long-Term Autonomy*), Arlington, USA]

- Classifying Group Emotions for Socially-Aware Autonomous Vehicle Navigation - **Aniket Bera**, *Tanmay Randhavane, Emily Kubin, Austin Wang, Kurt Gray, Dinesh Manocha* [IEEE Conference on Computer Vision and Pattern Recognition Workshops 2018, Salt Lake City, Utah]
- Efficient and safe vehicle navigation based on driver behavior classification - *Ernest Cheung, Aniket Bera, Emily Kubin, Kurt Gray, Dinesh Manocha* [IEEE Conference on Computer Vision and Pattern Recognition Workshops 2018, Salt Lake City, Utah]
- Classifying Driver Behaviors for Autonomous Vehicle Navigation - *Ernest Cheung, Aniket Bera, Emily Kubin, Kurt Gray, Dinesh Manocha* [Towards Intelligent Social Robots (IEEE/RSJ International Conference on Intelligent Robots 2018 Workshop), Madrid, Spain]
- Socially Invisible Navigation for Intelligent Vehicles - **Aniket Bera**, *Tanmay Randhavane, Emily Kubin, Austin Wang, Kurt Gray, Dinesh Manocha* [Workshop on Planning, Perception and Navigation for Intelligent Vehicles (IEEE/RSJ International Conference on Intelligent Robots 2018 Workshop), Madrid, Spain]
- Automatically Learning Driver Behaviors for Safe Autonomous Vehicle Navigation - *Ernest Cheung, Aniket Bera, Emily Kubin, Kurt Gray, Dinesh Manocha* [Workshop on Planning, Perception and Navigation for Intelligent Vehicles (IEEE/RSJ International Conference on Intelligent Robots 2018 Workshop), Madrid, Spain]
- LCrowdV: Generating Labeled Videos for Simulation-based Crowd Behavior Learning - *Ernest Cheung, Tsan Kwong Wong, Aniket Bera, Xiaogang Wang, Dinesh Manocha* [European Conference on Computer Vision Workshop 2016, Amsterdam, Netherlands]

## PUBLIC DATASETS

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- *Simulated pedestrian dataset with varying crowd density, population, lighting conditions, background scene, camera angles, agent personality and noise level to help in training models for crowd understanding, including pedestrian detection, crowd classification, etc.* Link: <http://gamma.cs.unc.edu/LCrowdV/#dataset>
- *A public domain dataset, EWalk, with videos of walking individuals. We also provide their gaits in the form of 3D positions of 16 joints and labeled emotions obtained using a perception study.* Link: <http://gamma.cs.unc.edu/GAIT/#EWalk>
- *High resolution crowd dataset captured in dense pedestrian crossings in India. Dataset consists of videos of indoor and outdoor scenes recorded at different locations, each with 30-80 pedestrians.* Link: <http://gamma.cs.unc.edu/RCrowdT/>
- *A traffic dataset (TRAF) comprising of dense and heterogeneous traffic. The dataset consists of the following road-agents: cars, busses, trucks, rickshaws, pedestrians, scooters, motorcycles, carts, and animals and is collected in dense Asian cities.* Link: <https://go.umd.edu/TRAF-Dataset>

## MEDIA COVERAGE

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- “There’s a new AI that can guess how you feel just by watching you walk” - *Fast Company*. Link: <https://www.fastcompany.com/90375885/>
- “Identifying perceived emotions from people’s walking style” - *Tech Xplore*. Link: <https://techxplore.com/news/2019-07-emotions-people-style.html>
- “A path for all walks of life!” - *Ideas & Discoveries*. Link: <https://www.pressreader.com/usa/id-magazine/20190901/282544429866813>
- “Ready, Set, Brake!” - *Association of American Universities / UNC*. Link: <https://www.aau.edu/research-scholarship/featured-research-topics...>
- “New Computer Science Building unveiled on Maryland Day” - *The Sentinel*. Link: <https://pgs.thesentinel.com/2019/05/02/new-computer-science-building...>
- “Indian Researcher & His Team Build AI That Can Tell How We Feel Just By Seeing Us Walk” - *Indiatimes/ Times Group*. Link: <https://www.indiatimes.com/technology/science-and-future/...>
- “New software can track many individuals in a crowd” - *Science*. Link: <https://www.sciencemag.org/news/2017/04/new-software-can-track...>
- “Cientistas ensinaram IA a perceber como nos sentimos pela nossa forma de andar (*Portuguese*)” - *ZAP aeiou*. Link: <https://zap.aeiou.pt/cientistas-ensinaram-ia-perceber-nos-sentimos-pela...>
- “AI mới này có thể đoán cảm giác của con người thông qua dáng đi (*Vietnamese*)” - *Genk*. Link: <http://genk.vn/ai-moi-nay-co-the-doan-cam-giac-cua-con-nguoi...>
- “L’IA qui peut reconnaître l’humeur d’une personne en analysant sa démarche (*French*)” - *Neon Magazine*. Link: <https://www.neonmag.fr/lia-qui-peut-reconnaitre-lhumeur-dune..>
- “Une nouvelle intelligence artificielle peut deviner les sentiments des gens en les regardant marcher (*French*)” - *Tuxboard*. Link: <https://www.tuxboard.com/une-nouvelle-intelligence-artificielle-peut-devi..>

## PROFESSIONAL SERVICE

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### PROGRAM COMMITTEE

- *American Association for the Advancement of Science (Reviewed 6 Research Proposals/Grants - RDO-ICG (International Collaboration Grant) 2018/2019)*
- *International Joint Conference on Artificial Intelligence 2018, 2019* - (Program Committee Member)
- *Association for the Advancement of Artificial Intelligence, 2019* - (Program Committee Member)

### REVIEWER

- *IEEE International Conference on Robotics and Automation 2015, 2016, 2017, 2018, 2019*
- *IEEE/RSJ International Conference on Intelligent Robots and Systems 2016, 2017, 2018, 2019*
- *ACM CHI Conference on Human Factors in Computing Systems 2019*
- *Computers & Graphics 2018*

- *Applied Mathematical Modelling 2018*
- *Transactions on Applied Perception 2018*
- *IEEE Transactions on Pattern Analysis and Machine Intelligence 2018*
- *IEEE Virtual Reality Conference 2018, 2017, 2019*
- *IEEE Transactions on Multimedia*
- *IEEE Robotics and Automation Letters*
- *PLOS ONE*
- *Sensors*
- *Journal of Imaging*

## WITHIN UNC

- **CSSA President** (2016-2017). Helped with research marketing, talks and non-academic social activities. Expanded the CSSA structure.
- Member of the search and hiring committee for the **Diversity Coordinator position**, 2017.
- Represented the department at the **Graduate and Professional Student Federation (GPSF)** meetings and discussed various student issues/solutions.
- Co-ordinating and organizing the visit for the newly recruited graduate students - **Candidate's Day 2017**.
- Met with the **external review committee** in November 2017 to discuss students' perception of the department and related issues.

## TEACHING RECORD

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### COURSES

- Co-instructor for *COMP 790-058: Multi-Agent Simulation for Crowds and Autonomous Driving, 2017*
- Teaching Assistant for *COMP 116: Introduction to Scientific Programming, 2013*

## STUDENT SUPERVISION

### GRADUATE STUDENTS

- **Rohan Chandra (*University of Maryland*)**: Supervising in real-time pedestrian tracking and prediction related research. Focus on using different psychology inspired crowd simulation models to improve accuracy and speed.
- **Uttaran Bhattacharya (*University of Maryland*)**: Supervising in human behavior learning, psychology and behavior understanding related projects.
- **Trisha Mittal (*University of Maryland*)**: Supervising in multi-modal emotion classification and learning.
- **Niall Williams (*University of Maryland*)**: Supervising in multiple the social VR projects.
- **Ernest Cheung**: Supervising in multiple research projects including data-driven pedestrian and driver behavior detection algorithms, pedestrian detection and tracking algorithms [*Cheung et al. 2016, 2017, 2018*].

- **Tanmay Randhavane:** Supervising in multiple the socially driven VR/robotics projects. Focus on learning human behaviors and using them in a virtual reality setting [Randhavane et al. 2017, 2018].
- **Vasavi Gajarla** (Former student) Supervised Master’s thesis project - Analyzing pedestrian dominance in realtime using multi-camera 3D gait detection.
- **Rohan Prinja** (Former student): Supervised research project on human-robot interaction.

#### UNDERGRADUATE STUDENTS

- **Austin Wang:** Supervising on four research projects related to pedestrian behavior learning. Designed and conducted multiple perceptual user studies. Co-authored and collaborated with other GAMMA research group members.
- **Anson Wong:** Supervised a project on data-driven pedestrian detection and crowd behavior classification using a large virtually-generated labeled image dataset. Co-authored [Cheung et al. 2016]
- **Changhao Liu:** Supervising a project on realtime anomaly detection using various trajectory-level features.
- **Husam Shaik:** Supervising a project on 3D modeling various large-scale environments and human-like characters and using crowd simulation models.
- **Josh Taekman:** Supervised a project on plausible group trajectory planning for human-like characters and building a 2D visualizer.